Overview on
NA60 Vertex Spectrometer Preparation

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PHENIX Detector Council meeting, December 12, 2001

- **Outline of the NA60 Experiment**
- **Vertex Spectrometer**
- **Preparations for the Summer 2002 run**
- **Pixel Detector related issues and PHENIX engagement**

NA60 Experiment

"Study of prompt dimuon and charm production with Proton and Heavy Ion Beams at the CERN SPS"

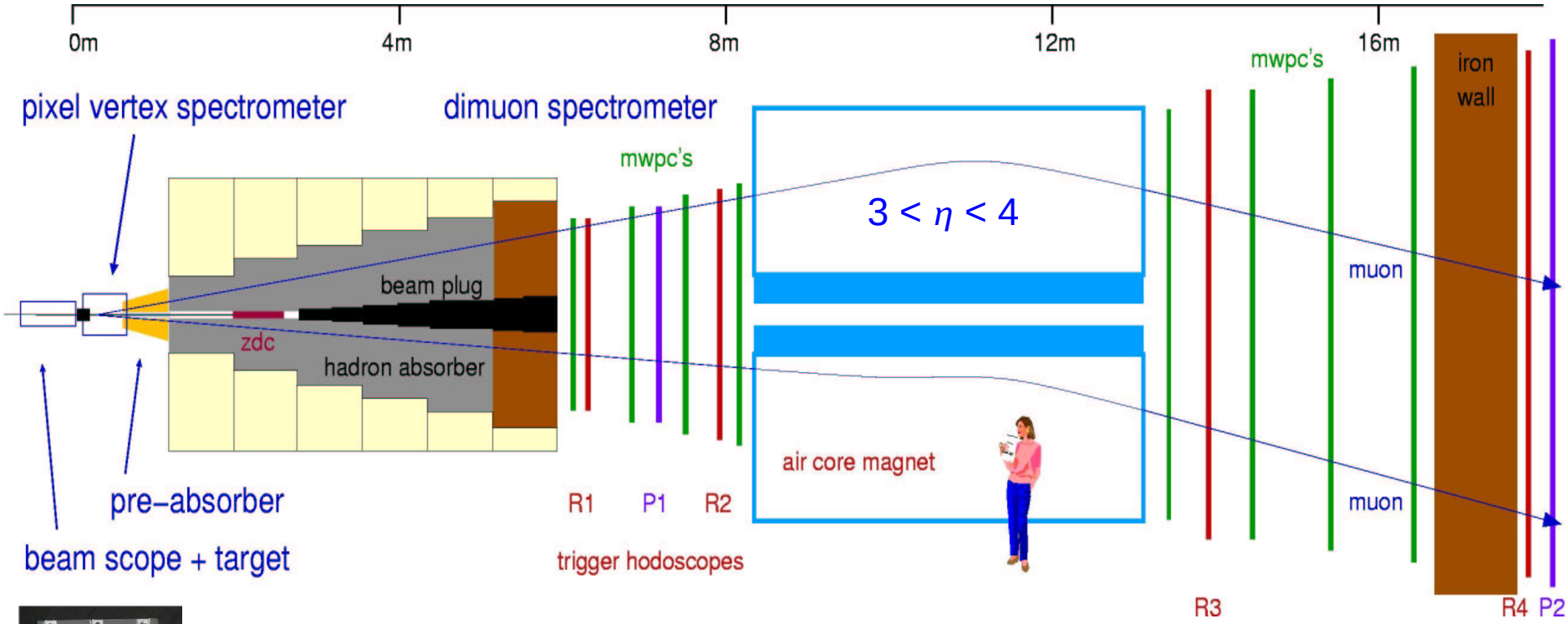
physics of charmonia production − address open questions from present SPS heavy−ion program, as $\sigma_c(\varepsilon)$, J/Ψ,Ψ' suppression, χ_c(A), ...

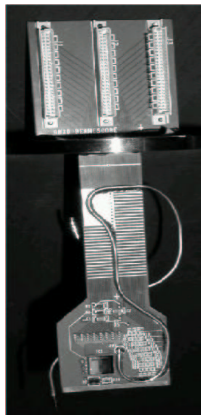
first experiment to directly measure open charm and true prompt dimuon production; one of the few "live" experiments at CERN in the next years

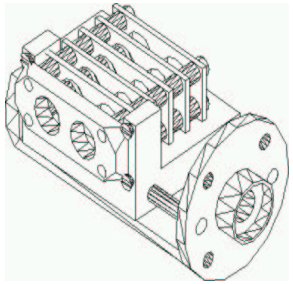
strategy: **NA50 muon spectrometer**
+ radiation tolerant high−granularity silicon vertex tracker close to target, operating in a magnetic field

* track all charged particles in magnetic vertex spectrometer
* measure angles, momenta, impact wrt. interaction point
* match to the muons which crossed the hadron absorber into the muon spectrometer, firing the trigger.

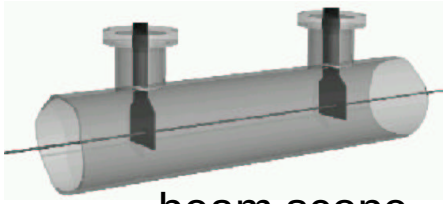
→ **event samples with distinct / very small impact parameters**



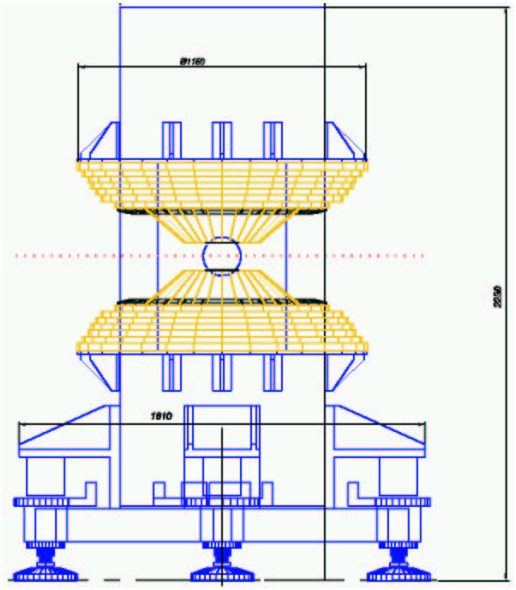




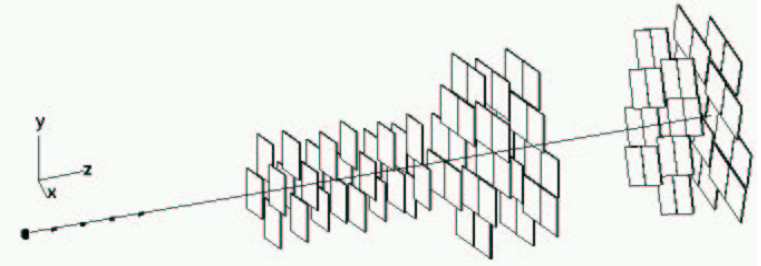
target holder



beam scope

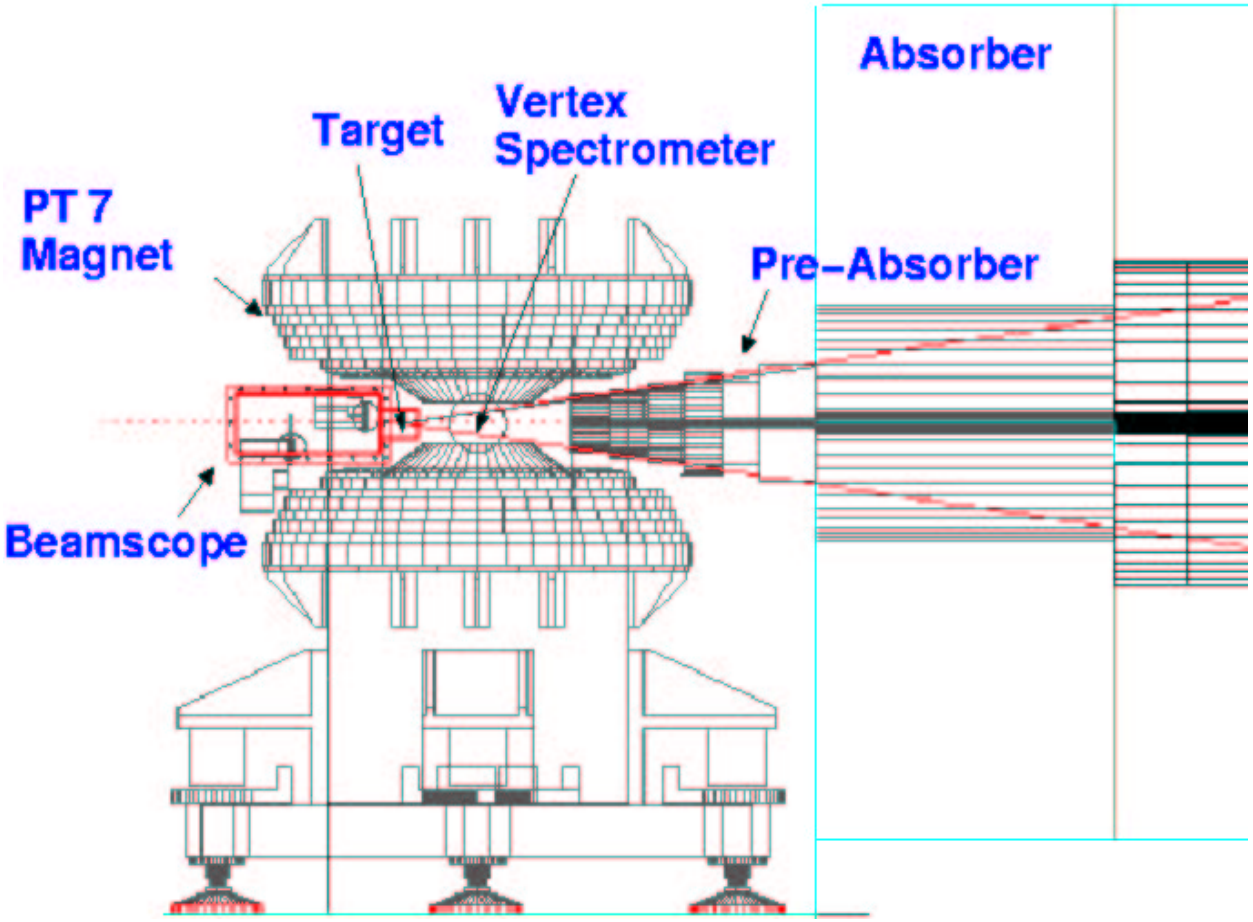


dipole magnet



10 pixel detector planes

PT7 Magnet Region



* "new" magnet in place since NA60 proposal: PT 7
* dipole , B= 2.5 T
* open "C" geometry
* pole faces:
  - gap: 10 cm
  - diameter: 30 cm
  - more space for silicon telescope: ~ 5cm in z
    extra 11th Si plane
* $\int$Bdl = 0.95 Tm
  $\rightarrow$ dp/p $\simeq$ 0.5% for p_t>5GeV/c

NA60 Vertex Spectrometer Preparations

Test run October 2001:
- cryogenic beam scope commissioned
- micro strip telescope to replace pixel planes in 2002 run: 2 planes tested, NA60 hybrid + ATLAS sensor
- data aquisition and detector control system running, integrated into NA60 online system.

For 1st physics run May/June 2002:
- build full micro strip telescope, with NA60 sensor from BNL instrumentation group
- readout ready, mechanics finalized early 2002
- build and integrate 1st small pixel plane
- project and work in cooperation with ALICE

ALICE/NA60 pixel team:
- production management via ALICE
- detailed characterization of pixel detectors is proceeding in the lab, before and after bump bonding of readout chips and sensor layers.
- ceramic chip carrier + readout chain are being finalized

Pixel Detector I

- 48 wafers with 86 readout chips each are at CERN, 16 available to NA60
- tests on probe station started: ~30% good, 30% OK, ~30% bad, i.e. expected yield

  → 10 wafers expected to yield~300 chips, enough for full pixel telescope with 88 chips + spares + exchange 1st plane after some irradiation.

  → aim at 160−170 good chips.

- bump bonding at VTT: first results yield ~100% OK
- detectors: Canberra for ALICE, NA60 should use more rad−hard material

- readout components: *working*

  a) pixel detectors on **ceramic chip carrier,** 150 μm Al_2O_3

  → 16 ceramics available at CERN early January 2002

  b) chip carrier mounted on **adapter card**:
  power supplies, biases, readout interface, JTAG controls (presently external input via VME system)

  −−− cables to PC in save distance outside beam area. Max. 1.5 m.

  c) **pixel readout board**:
  zero suppression, encoding, FIFO memory

  d) CERN FLIC **PCI card**, readout with LINUX PC

Pixel Detector II

− currently reviewed: − rad−hard ALICE "pilot" front−end control chip now available; redesigned+ simplified adapter card eliminates need for external JTAG controller and VME.

− introduce GLinks between adapter card and readout board:
1 high−speed link: data
1 low−speed link: commands, trigger, JTAG
→ eliminate cable length issue − better suited for NA60 hall.

− electronics available: early January 2002. Full chain ready/tested early February.

− from February 2002: subsequently build NA60 pixel planes until Fall 2002, starting with one small 4−chip plane.

Essential goal for NA60: Demonstrate successful pixel handling and 1st pixel plane fully characterized and operational in the Silicon microstrip telescope for the Summer run.

!! CERN's current very critial budgetary situation !!

... small team −fight time and resources ...

PHENIX engagement in this project

- Via RIKEN effort: NA60 bump bonding financed
- NA60 pixel team complemented by PHENIX−RIKEN(SUNY) people: Hiroaki O., Johann H.

- Goals for PHENIX, detector aspects:
  * gain experience with multiple silicon detector systems in NA60 environment
  * obtain full readout chain and frontend chips/detector module for PHENIX, setup lab to assess detector's performance (in Stony Brook or at BNL − coordination!)

  * Adapt back−end of readout to PHENIX electronics.
    Approach followed in Stony Brook: interface Drift Chamber FEM to Pixel Readout Board

- Work on a PHENIX pixel detector prototype, building on the ALICE pixel chip:

  Try to place prototype modules in NA60 as the extra 11th plane, for run in 2003 ??

- Beyond scope of NA60, but e.g. together with ALICE: work on thinned detectors.